PLCcore-9G20

IEC 61131-3 AND C/C++ PROGRAMMABLE SINGLE BOARD COMPUTER

SYS TEC ELECTRONIC
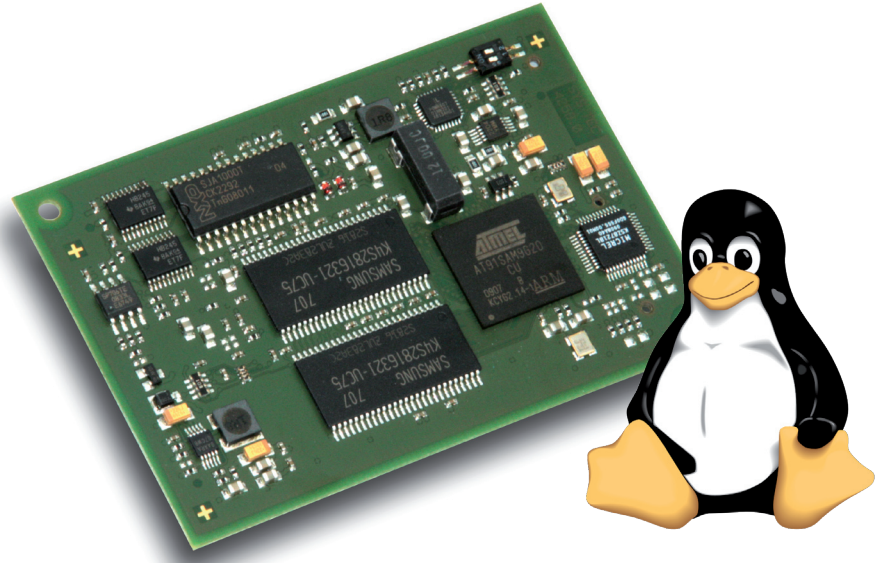
High-performance 32bit Embedded Industrial PLC

Developing modern and sophisticated control systems requires versatile, interdisciplinary know-how. This does not only involve hardware and application development. In fact, operating system adaptations, the connection of communication and field- buses and data exchange between processes running in parallel become necessary. By applying the PLCcore-9G20 as PLC kernel in user-specific controls this development effort can be minimized.

The PLCcore-9G20 is an insert-ready OEM-able single board computer running Linux and a ready-to-use IEC 61131-3 runtime kernel together with a CANopen manager pre-installed. The module allows for integrating a compact and high-performance Hard-PLC into customized, user-specific applications with minimum efforts - without suffering from high cost caused by IEC 61131-3 development or resale licenses. Due to its comprehensive and high-performance software, it is suitable for the usage in various industrial application fields.

The ARM9-CPU runs at 400 MHz and features high performance at low power consumption. Linux as operating system allows simultaneous execution of other user applications while PLC firmware is running. At the same time PLC program and user software can exchange data bidirectional by using the process image.

Due to the freely programmable on-board FPGA, it is possible to realize basic digital in- and outputs as well as highly complex peripheral units. Both, the VHDL sources of the FPGA and the C source code of the I/O driver, are available as Driver Development Kit (DDK).

The PLCcore-9G20 includes 1 CAN interfaces with a fully featured CANopen manager. In addition to Ethernet and CAN interface, the PLCcore-9G20 features two USB 2.0 Full Speed host ports, one USB device port and 4 UART ports. Due to numerous communication interfaces, the module is well-suitable as central unit in distributed automation systems and as communication gateway.

Linux as a mainstream CPU supports the ARM9 architecture and hence ensures the availability of actual kernel versions for the module. Moreover, for ARM processors there exist various ports of current standard software and the industry-proven Linux Realtime extension Xenomai.
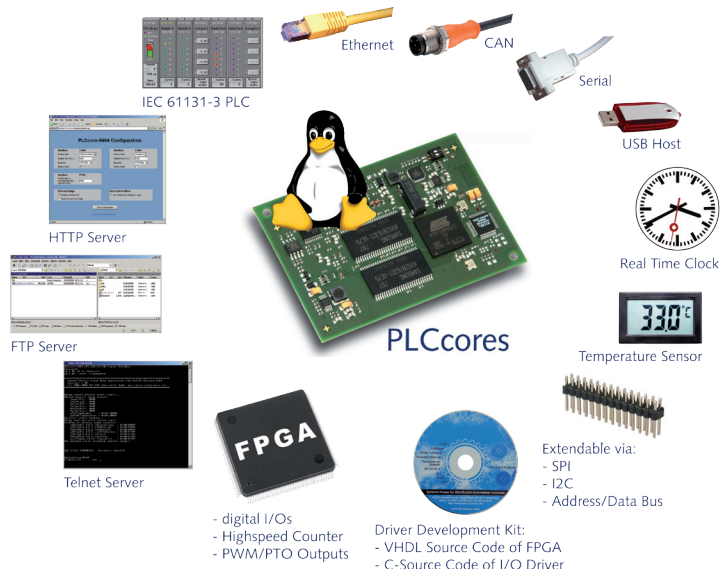
PLCcore-9G20 Starter Kit

The PLCcore-9G20 was designed to be plugged onto a carrier board. Both, the module and a development board as a reference carrier board, are included in the PLCcore-9G20 Starter Kit. The carrier board contains the I/O connectors required for immediate start-up of the module as well as other interface circuitry not provided on the SBC module itself. The Starter Kit provides an excellent platform to evaluate controllers, develop software as well as specify and determine the feasibility of new embedded designs based on the PLCcore-9G20.

Designed For:

High-performance Embedded PLC

Communication Gateways

Embedded machine controls

Insert-ready OEM-able PLCcore

Module Features

• Hardware:

32-bit Atmel AT91SAM9G20, 400MHz

4 MiB user application memory

32 kiB non-volatile process data memory

FPGA (VHDL source included in DDK)

RTC and Temperature sensor on-board

3.3 VDC Single-voltage power supply

• Software - IEC 61131-3:

Linux including Telnet, FTP and HTTP Server pre-installed

IEC 61131-3 runtime kernel pre-installed

Programmable in IEC 61131 and in C/C++

IEC 61131/PLC and Linux application simultaneously

Data exchange via shared memory

Download: Ethernet, CAN-bus and serial port

CANopen Manager with automatic node configuration (CiA 302 and CiA 314)

• I/O configuration (standard driver, fully customizable via DDK):

up to 24 digital inputs and 24 digital outputs on-board

4 High-speed counter (Pulse/Dir or A/B)

4 PWM-/PTO output (Pulse/Dir)

3 Analog inputs (10-bit)

Modifiable via DDK (using memory mapped I/O, I2C and SPI)

• Communication interfaces:

1x 10/100 Mbps Ethernet, on–board PHY

1x High-speed CAN2.0B

2x USB 2.0 host, 1x USB 2.0 device

4x Serial

1x SSC

• Dedicated function blocks for:

CANopen master and slave services

Ethernet (UDP) communication

Serial interfaces

Real Time Clock (RTC)

Hardware counter and PWM/PTO

Non-volatile memory

• HMI units (target specific on the baseboard):

Run/Stop-Switch and Run-/Error-LED

DIP- and HEX-Encoding Switches

• Operating temperature range:

Commercial: 0°C to +70°C

Industrial: -40°C to +85°C

The PLCcore-9G20 is an high-performance single board computer subassembly module, supporting textual and graphical programming methods according to IEC 61131-3. The various industry-proven on-board communication interfaces are accessible through intuitive function blocks. The PLCcore-9G20 combines an extra-ordinary I/O flexibility with high-performance program execution. Therefore, the module has various I/O extension interfaces to connect custom peripherals easily, e.g. memory mapped I/O ports, SPI, I2C et cetera. The module comes pre-programmed with a Linux operating system including the fully featured IEC 61131-3 runtime kernel and ready-to-use software drivers – no need to suffer extra resale licenses or even expensive development licenses.

The IEC 61131-3 runtime kernel supports users with a broad range of high-performance program development functionalities and power-full on-target debug functionality. The PLC program can be updated anytime during runtime. Its broad variety of communication interfaces makes the PLCcore-9G20 best suitable, wherever networked applications are required. Dedicated communication function blocks enable easy access to all interfaces. The CANopen manager allows for a flexible expandability via CAN-bus; just as easy as Plug & Play. Furthermore, the comprehensive CANopen library supports a very simple data exchange with other CANopen devices.

Designed to performance, the core module incorporates all high-speed components on an compact, low-EMI multilayer PCB. The target-specific base board holds the slower clocked peripheral components and thus, can be kept "simple" and less critical in PCB design. The PLCcore-9G20 has a powerful on-board FPGA. It allows for implementation of basic digital input and output lines as well as highly complex peripheral units. Apart from basic I/Os, the standard version of the FPGA also contains freely configurable high-speed counters and a powerful PWM/PTO units. Both, the VHDL sources of the FPGA and the C source code of the I/O driver, are available with our Driver Development Kit (DDK). Hence, the user is able to adapt the I/O configuration freely and easily to various application requirements.

The pre-installed Linux operating system supports simultaneous execution of one or more C-code user-applications besides the PLC runtime kernel. A special API provides functions to share the process image between the C-code user-application and the PLC program. Dedicated tasks could be assigned to external hardware interrupts or system events with least latency. This provides a new degree of freedom for combining PLC applications with high-speed processing low-level OS functions.

The CPU of the PLCcore-9G20 includes a real hardware MMU. The Linux operating system allows that single tasks are running in separate Virtual Machines. Those are independent and isolated from each other. That means, each task is protected and shielded from the rest of the system. A crash of one of those tasks cannot impair the integrity of the overall system.

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